Due date: Wednesday, October 18, 2023, 11:59 PM

What To Do:

- Students in 601.415/615 should implement queries 1-37 and 50-62 in mysql. 601.415/615 students should write the QBE equivalent to queries 1,3,4,15,21,22,36,37,38.

- Students in 601.315 should implement queries 1-49 in mysql. 601.315 students should write the QBE equivalent to queries 1,3,4,21,36,37,38.

What To Hand In:

You should write all your SQL queries in a text editor, formatted clearly (preferably using `SELECT/FROM/WHERE/GROUP_BY` commands in all caps, with attribute names in all lower case and relation names with the first letter capitalized).

Submit this program using the gradescope, using the same protocol as in HW1. In addition, you should submit a `spool` log of your sql code running on the actual database tables in `http://www.cs.jhu.edu/~yarowsky/jhu2023sql.txt` or `/home/cs415/jhu2023.sql` (on the undergraduate network). Options for doing this (such as cutting and pasting the sql code into the MySQL interpreter) are covered in class). You should also submit this spool file via the interface above.

Finally, you are required to submit an electronic copy of your QBE queries based on editing the plain-text schema we have provided for you in `http://www.cs.jhu.edu/~yarowsky/jhu.schema`.

Queries:

The relational table specifications for all queries used in this assignment are given in the file `/home/cs415/jhu.sql` on the undergraduate network. They are specified in SQL `CREATE TABLE` syntax.

You should NOT create temporary tables to store intermediate results to simplify computation. Use nesting of expressions or derived relations in the `FROM` clause as appropriate.

For the purposes of this exercise, the `enrolled_in` relation only contains one semester’s worth of courses (student’s classes for the most recent semester) and the students’ grades for those courses. There are no semester/year attributes in the `enrolled_in` relation. Questions concerning class enrollment should use the entire relation.

When a question asks “List the name” of a person, give their first name followed by their last (family) name.

Note that these queries are not necessarily listed in order of increasing difficulty. Also note that queries frequently build on other queries and subsequent queries may require only a few changes from their predecessors.

1. List the student names and major names of all students who are not enrolled in any courses from his/her major.
2. For each major, list the total number of students in that major who play a sport or are on a scholarship.

3. Print the names of all students from New York, who live in Wolman, who major in Computer Science, who are allergic to peanut butter and who are majors in the Computer Science department.

4. List the names of all activities that at least one student participates in but and no faculty member participates in.

5. List all the courses Bruce Wilson is enrolled in, giving the course name, the number of credits offered by the class (e.g. 3), Bruce’s letter grade in the class, and his numeric gradepoint for the class. For example:

<table>
<thead>
<tr>
<th>CID</th>
<th>Course Name</th>
<th>Credits</th>
<th>LetGrade</th>
<th>Gradepoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>340.108</td>
<td>Intermediate Basketweaving</td>
<td>3</td>
<td>A</td>
<td>4.0</td>
</tr>
<tr>
<td>220.209</td>
<td>Physics for Poets</td>
<td>3</td>
<td>B</td>
<td>3.0</td>
</tr>
<tr>
<td>601.117</td>
<td>Exploring the Internet</td>
<td>3</td>
<td>B+</td>
<td>3.3</td>
</tr>
<tr>
<td>340.500</td>
<td>Beginning Pet Grooming</td>
<td>2</td>
<td>A-</td>
<td>3.1</td>
</tr>
</tbody>
</table>

To help you with the letter-grade to gradepoint conversion, a relation called grade-conversion has been defined for you.

<table>
<thead>
<tr>
<th>Lettergrade</th>
<th>Gradepoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.0</td>
</tr>
<tr>
<td>A-</td>
<td>3.7</td>
</tr>
<tr>
<td>B+</td>
<td>3.3</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

6. Compute Bruce Wilson’s grade point average (for all courses listed for him in the enrolled_in relation), restricted to courses in his major. The GPA is defined as the sum of (gradepoint × course.credits) for all his major courses divided by the sum of his course.credits for all his major courses. For the example above, assuming his major is 340, his major GPA would be (12 + 6.2)/5. You need only to list his student ID number, total number of credits he has enrolled in and his major GPA.

7. List the first and last names of all students in the database and their GPA’s (restricted to courses in the student’s major and calculated as in the problem above). Format the GPA so that it shows only one value to the right of the decimal point.

8. Create a view named Student_GPA that includes 2 attributes, the student’s ID number and computed GPA. You may (and should) use this view for subsequent queries involving GPA.

9. Create a table (filled with appropriate values) that maps between a letter grade and the next lower letter grade. Assume that the grade lower than F is F. For example:
<table>
<thead>
<tr>
<th>LetterGrade</th>
<th>NextLower</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>A+</td>
<td>A-</td>
</tr>
<tr>
<td>A-</td>
<td>B+</td>
</tr>
<tr>
<td>B+</td>
<td>B</td>
</tr>
<tr>
<td>B</td>
<td>B-</td>
</tr>
</tbody>
</table>

Also, write an SQL command that uses this table to lower the grades of all students enrolled in courses taught by their parents to the next lowest grade (e.g. B to B-). **Do NOT** actually run this last SQL command, just write it.

10. List the name of and age of students who have every allergy listed in the database.

11. List all dorms and the average GPA of their residents, sorted by GPA in descending order.

12. For each major, list the total number of students in that major who play a sport, the total number of students in the major, and the percentage of the total students in the major who play a sport.

13. For each department, list the name of the department, the number of majors in the department, and the average GPA of students in that department.

14. What is the average GPA of students who like Taylor Swift?

15. Which students love someone whose hometown is within 50 miles of their own?

16. Find the favorite NBA team of the student with the highest GPA in the database out of all the students who play basketball.

17. What is the most liked NBA team by students who play at least one sport?

18. What is the most liked NBA team by students who don’t play any sports?

19. What is the most listened to genre of music by students who both play a sport and have a favorite NBA team?

20. List the dorm name and dorm room number of the dorm room with the most students living in that dorm room.

21. List the names, age, sex and major of those students who are enrolled in at least one course that Linda Smith is enrolled in, but enrolled in no courses that Bruce Wilson is enrolled in.

22. List all pairs of alumni who live in the same city as each other, including the names, majors and grad year of the alumni and the name of the city that they live in.

23. For each major, give the average amount of the financial aid received by students in that major, limited to those students who have received financial aid.
24. For each dorm, give the total amount of financial aid received by students living in that dorm (including dorms where there is no student receiving financial aid).

25. List the names and ages of students who have a food allergy and are enrolled in a course taught by a faculty member who also has a food allergy or a course where ANOTHER (different) student has a food allergy.

26. List the names and total occupancy of dorms where the average GPA of residents is above 3.5, sorted by total occupancy in descending order.

27. List the name of the student with the greatest total number of absence days (combined between all their classes), along with that total number.

28. What is the date in the database with the most student absences, and give that total number.

29. List the student first name, last name, age and sex that were victim of a campus safety event and give the name of the dorm that they live in.

30. Find the name of the dorm with the highest number of campus safety events, along with the total number of safety events for students living in that dorm.

31. List the faculty members with an office in Krieger who have office hours on Friday, along with their office hours and office room.

32. List all name pairs of students who both love each other reciprocally (mutual love)

33. List all name pairs of students where one student loves the other but it is not reciprocated.

34. List the names of students who have satisfied all of the prerequisites for DISTRIBUTED SYSTEMS.

35. List the name of the class(es) with the most number of prerequisites, along with the total number of required prerequisites.

36. List the names and major of the number of students who play a sport and who receive financial aid, but do not live in a dorm and are not involved in any activities and who love someone who doesn’t love them.

37. Write an interesting query in English based on this database, and then answer it in the Relational Algebra (creativity, complexity and accuracy all count).

38. List the names of all students having an “environmental” allergy and are loved by at-least one other student.

39. List the name, age and sex of students with no listed roommates.

40. List the names of activities with the most faculty participation.

41. List all students who smoke and have working fireplaces in their dorm.
42. List the names and major of all the students that slept in the COMPUTATIONAL MODELS class.

43. For every student with at least some dorm-living preferences (e.g. smoking, sleep habits, etc.), list the student’s name, one of those preferences, and the name of the dorm they are assigned to.

44. Which students love someone who like at least 2 of the same artists as them?

45. List the name and capacity of the dorm with the most students living in that dorm.

46. List the names and majors of the students who have satisfied at least one prerequisite for Natural Language Processing (limited to actual JHU courses satisfying the prerequisite).

47. For all the students who have volunteered in the past, find the average number of volunteer hours per student.

48. List the students who have volunteered in more than one organization and participated in a club.

49. For all student enrolled in any section of Databases (601.315/415/615), list the student’s name, their grade in the Databases class, and the number of days the students are absent from the class.

50. Find the top 5 activities with the most student participants.

51. What is the most played sport by students who like the artist with the most monthly listeners?

52. Which course CA had the most COVID diagnoses on separate occasions?

53. For the team discovered in Question 16, which year(s) did that team win a championship?

54. For each dorm, list the name and major of the student living in that dorm who is enrolled in the most courses.

55. List the name(s) of students who are enrolled in every course taught by Jason Eisner.

56. List the name and capacity of the dorm with the most students living in that dorm, along with the number of students living in that dorm and that numbers percentage of capacity (all of the 4 fields in 1 table).

57. List the name and GPA of all students who have volunteered for more than 100 hours AND have had an internship at a software company.

58. For all students with any absence record in the database, and for all courses they are listed absent for (one line for each pair), list the student’s name, the course name, the grade in that class, and the number of days the students are absent from the class.
59. Of the students who have a GPA over 3.7, list the name, GPA and total number of absence days of the student who has the highest total absence day in any class.

60. List the names, age, sex and major of those students who are enrolled in all of the courses that Linda Smith is enrolled in.

61. List the names and majors of the students who have satisfied all of the prerequisites for Natural Language Processing (limited to actual JHU courses satisfying the prerequisite).

62. For each campus safety event, list the total number of students experiencing that event type, along with the total number of female students experiencing that event type, and the percentage which are female.